

TRESHER'S
BEN TRASHER'S MILL
(Judkins Wagon & Woodworking
Shop; Alexander Jack's Dye &
Print Works)
State Aid No. 1
Barnet Center
Caledonia County
Vermont

HAER No. VT-10

HAER,
VT,
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PHOTOGRAPHS

HISTORICAL AND DESCRIPTIVE DATA

Thresher's Mill

HAER VT-10

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HISTORIC AMERICAN ENGINEERING RECORD

BEN THRESHER'S MILL

(Historic names: Alexander Jack's Dye & Print Works; Judkins Wagon & Woodworking Shop).

Location: State Aid No. 1 (or Star Route 1), on Stevens River, near Barnet Center, Vermont

Date of Construction: Textile Mill, 1872

Present Owner: Laurance S. Rockefeller Mt. Pleasant, New York

Present Use: Wagon, Woodworking & Blacksmith Shop

Significance: Alexander Jack built the mill as a Dye & Print Works in 1872. J. Loren Judkins established a Wagon Shop in 1893 and added the Blacksmith Shop c. 1895. The timber frame and plank dam is intact. The 1911 Rodney Hunt horizontal turbine still powers wood & metal working machinery. A Boomer & Boschert hydraulic cider press installed c. 1915, is still in place. Ben Thresher began working in 1941 and acquired the mill in 1947.

Historian: John P. Johnson
September 1979

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Introduction

The purpose of this HAER historical report is to document the development of Ben Thresher's Mill on the Stevens River in Barnet Center, Caledonia County, Vermont. In 1836, a dam was first built here and a saw mill operated on this site from 1836 until c. 1855. The site was idle from c. 1855 until 1872. The present mill was constructed in 1872 as a Dye & Print Works. A Wagon & Woodworking Shop was established here in 1893 and the Blacksmith Shop added c. 1895. For over 100 years this water-powered mill has been a vital local workshop serving the needs of farmers and craftsmen in this rural community. The study of the Wagon, Woodworking and Blacksmith Shop in the context of local history and the industrial archeology of existing structures and machinery are the main threads running throughout this report. Investigation, research and interviews were conducted during the summer of 1979.

I. Early Industries in Barnet, 1770-1870

Ben Thresher's Mill is located on the Stevens River in Barnet Center, Vermont. The history of the site is recorded in the growth of rural industries and communities in Caledonia County. In the late 18th and early 19th century, saw mills, grist mills and textile mills were built simultaneously with small communities along the many waterways that flow into the Connecticut River. The Stevens River flows out of Harvey's Lake in West Barnet, through Barnet center southeasterly about seven miles and discharges its waters into the Connecticut River at Barnet Village. The Stevens River drains an area of forty-three square miles and falls approximately 450 feet from Harvey's Lake to the Connecticut River. In Barnet Village it falls eighty feet. Stevens Falls provided water power for the first rural mills in Caledonia County. Thresher's Mill is four miles upriver from the first settlement in the county at Stevens Falls (1).

Barnet Township was chartered in 1763 by Governor Wentworth of British Provincial New Hampshire. In July 1770, Enos and Willard Stevens, chief proprietors of the Township, contracted Colonel John Hurd to build the first saw and grist mills at the Stevens Falls. Colonel Hurd, a native of Boston, Massachusetts, settled in Haverhill, New Hampshire in 1765. He was a prominent citizen and a member of the Provincial Congress. Hurd agreed to build the mills provided that Stevens would supply the mill irons and deliver them to the Falls. Under his direction, the mills were completed in 1771. In return for building the first mills in Caledonia County, Hurd received 100 acres of land extending along the bank of the Connecticut River and running westwardly (up the Stevens River) far enough to include the Falls. Hurd cleared about twenty acres, erected buildings and encouraged the settlement of Stevens Village (early name of Barnet Village). By 1773, there were already fifteen families in the new village. In 1774, Colonel Hurd returned to Haverhill and the land and both mills were deeded to Willard Stevens. The 1770s was the first decade of rural industry in this region of Vermont (2).

The 1780s was the decade of Scottish settlement in Barnet and Ryegate, Vermont. The journal of Colonel Harvey contains the earliest accounts of the Scottish settlement in Barnet. Alexander Harvey was the Agent for the United Company of Farmers for the Shires of Perth and Stirling in Scotland. Harvey arrived in America in 1774 to examine the country and selected the green mountains of Barnet as a desirable location for colonization. In November 1775, Harvey made the original purchase of 7,000 acres from Samuel Stevens. It was not until after the Revolutionary War, however, that most of the settlers from the Company arrived. By 1790, Barnet had grown to 74 families, which included 560 people with 133 males over the age of sixteen (3).

The new Scottish communities encouraged the growth of rural industries. In 1785, Enos Stevens built a "new" saw mill at the head of the Stevens Falls. In his journal, Stevens speaks of the "old" and the "new" saw mills being in operation at the same time. In 1787, Stevens built another grist mill. At this time other industries in Barnet included a tannery and a flax oil mill. The manufacture of pot and pearl ashes, commonly called "salts" was

extensive. Charcoal was made for local blacksmiths and, with the salts, was exported down the Connecticut River to Wells River and Hartford, Vermont. Maple sugaring was an early industry that continues to the present day. Saw mills were built at various sites on Joe's Brook, Endrick Brook, the Passumpsic River and the Stevens River. The up and down saw mills provided beams and boards for house and barn construction. In the late 18th century the principal industries centered around the production of the wood and wool (4).

The community at Barnet Center began shortly after the first Scottish settlers arrived in the Township. Prior to 1784, the first meeting house was built of logs. Construction for a second meeting house was begun in 1787 and the sale of pews began in February 1793. Dudley Carleton, a master carpenter from Newbury, Vermont, modeled the structure after others that he had built. The building served the town and Associate Presbyterian Church as a place of assembly until 1829. The Reverend David Goodwillie became the first minister in 1791 and continued until he was succeeded by his son, Thomas, in 1825. A Brick Meeting House was erected in 1829 of bricks made by Andrew Lang at the foot of the hill by the Stevens River. The old wooden meeting house was moved to the side and used only occasionally. The Brick Meeting House stood until it was destroyed by fire in 1849 (5).

Barnet Center is a unique community. It takes its name from being located nearly in the center of the Township. The community of scattered farm houses centers on the Barnet Center Church, parsonage and cemetery. No stores or mills occupy the immediate vicinity of the church as in most rural villages. The first mill to be built in the vicinity of Barnet Center was probably erected on the present Thresher's Mill site. In 1836 a dam and saw mill was erected one-half mile up the Stevens River toward West Barnet on the old stage road to Peacham.

On September 16, 1836, James Shaw signed two indentures or contracts with Bartholomew Carrick. The first contract was recorded with the Town Clerk on October 6. In this arrangement Shaw leased to Carrick a tract of undeveloped land and water privileges on the Stevens River. Carrick was to erect a mill dam and to rent the land for twenty years at the rate of one dollar payable each June first. Bartholomew Carrick erected the first dam at this site in the fall of 1836 and began construction of a saw mill. The second contract was recorded with the Town Clerk the following March 1837. By this time Carrick had apparently finished constructing the dam. In this arrangement, Carrick gave Shaw the right to draw water from the flume (flume) or mill dam. Shaw was to receive water power necessary to carry on the tannery business for a building 'about to be constructed' near Carrick's saw mill (6).

As I understand these two contracts, the arrangements were something like this. In September 1836, Shaw made two contracts with Carrick. Shaw probably agreed to lease Carrick the land for the construction of the saw mill if Carrick would build the first dam. Also that Shaw would then have the right to draw water for his own tannery which he would build immediately down river (east) of the new saw mill. By 1837, the present Thresher's Mill site

contained a dam; possibly similar to the present construction, and Bartholomew Carrick's saw mill. Shortly after, James Shaw constructed a tannery just east of the saw mill. Shaw operated the tannery until 1847 when he sold it to William Shaw and James McLaren (7).

Bartholomew Carrick; at age twenty-four; was an experienced carpenter. With the probable aid of a local blacksmith; Carrick constructed the up and down saw mill on the south bank of the river. The saw blade and the wrought iron crank; which drove the blade up and down in a wooden frame, would have come from a foundry. No records have survived concerning this saw mill. Barnet's historian; Frederick P. Wells; related the construction and operation of a 'typical' up and down saw mill of this era (8).

On September 9; 1837; Carrick leased to James Goodwillie his right to operate the saw mill. James Goodwillie's father; Joseph Goodwillie; was a brother of the Reverend David Goodwillie. Joseph Goodwillie was a blacksmith and operated a forge on the family farm near Barnet Center. (This forge was later; c. 1895; removed and added to the present mill building) James Goodwillie operated the saw mill from 1837 until c. 1855 (9).

In 1849; the lumber for the present Barnet Center Church was cut at James Goodwillie's Saw Mill. In February 1849; the Brick Meeting House was destroyed by fire. A building committee was organized on 1 April and the frame for the new wooden church raised within a month. The carpenters were John McGaffey and Charles Folsom; both of Lyndon; Vermont; each with a sixteen year old son. The lumber was cut at Goodwillie's Saw Mill by Henry J. Somers; probably a member of the building committee. The large timbers were all squared by hand with an adze. The finishing lumber; including the pews; came from James Roy's Saw Mill in West Barnet. All the planing of the doors and window sashes; was done by hand. The present Barnet Center Church was completed in July 1849 and continues to be the focus of this small rural community (10).

Goodwillie's Saw Mill was recorded in the Census of 1850. Goodwillie did custom lumber work and his business was capitalized at \$200. In the previous year; the mill processed 3;000 hardwood logs and 90;000 pulpwood logs. The total value of wood and lumber products for the previous year was \$570. The mill operated on the water power of the Stevens River with probably a breast type water wheel. Goodwillie's Saw Mill supplied lumber for nearly all the houses and barns in the vicinity of Barnet Center from 1837 until c. 1855 (11).

The Goodwillie Saw Mill was "demolished" sometime around 1855. The term "demolished"; as used in a later deed; is open to interpretation. The mill was possibly flooded out or destroyed by fire. Another possibility is that the mill was allowed to deteriorate and eventually fell down. In 1850 the mill was standing. Circular saws replaced many of the old up and down saw blades in Barnet around 1852. The original twenty-year lease with James Shaw would have expired in 1856 and; according to land records; was not renewed. Goodwillie's Saw Mill was a small operation and was possibly abandoned at this

time. H.F. Walling's Map of Caledonia County, published in 1858, does not show the mill. There was no mill standing from c. 1855 until the present mill was constructed in 1872. In 1870, James Shaw sold the mill tract at the "site of the old saw mill now demolished" to Alexander Jack (12).

The 1830s and 1840s were decades of continued growth throughout Caledonia County. At the encouragement of the Vermont Legislature, the local wool industry also flourished. At this time local wood industries manufactured a surplus of pulpwood, lumber and wooden ware. The Connecticut and Passumpsic Rail Road was chartered in 1835 and construction began in 1846. By November 1850, the section between Wells River and St. Johnsbury, a distance of twenty-one miles, was completed. McIndoes Falls, Barnet Village, East Barnet and Passumpsic Village all received railroad stations. In 1850, Barnet, which included these villages, boasted 2,521 people, its largest population in the entire 19th century (13).

II. Alexander Jack's Dye & Print Works, 1872-1887

The Alexander Jack phase in the development of the mill tract can best be explained with a brief introduction to the woolen industry in northern Vermont. The digression is important because the present mill was built partly on speculation that woolen industry in Barnet would continue into the last quarter of the 19th century. The textile industry did not expand and this affected the future history of the Jack Mill.

Domestic textile manufacture and the raising of sheep was encouraged by the Vermont Legislature as early as 1786. By this Act, a farmer was credited on the tax list with two shillings for every pound of wool shorn and one shilling for every yard of linen or tow hand-woven. This Act had a very favorable effect on the State's balance of trade (1). William Jarvis, among others, is credited with encouraging the sheep and woolen industry in northern New England. In 1811, while Consul to Spain, Jarvis purchased Merino sheep and introduced them to his farm in Wethersfield, Windsor County, Vermont. The Vermont woolen industry grew from Jarvis's original flock of 400 sheep (2).

Most farmers in the region raised sheep in the early 19th century. Several flocks in Barnet were started on a system of credit with the large sheep farmers in Newbury, Vermont and Haverhill, New Hampshire. Each farmer had a particular "ear mark" which identified his cattle and sheep. These marks were registered with the Town Clerk and heavy penalties were provided for the alteration of an ear mark. Until the introduction of spinning and weaving factories, farmers sheared their sheep in the early summer and brought their wool to the carding mill. After it was prepared for spinning, it was taken back to the home and spun into yarn by hand. The handspun yarn was woven on large wood-framed hand looms and then returned to the fulling mill for washing and finishing. Enos Stevens' Fulling Mill, built in 1797 in Barnet Village, was typical of the rural woolen industry. The mill had fulling stocks and later wool carding machinery, so that both processes were performed in one location (3).

In the 1820s several woolen mills were built in Caledonia County. In 1825, a charter was granted by the Vermont Legislature to Henry and Willard Stevens and Samuel Gleason. The enterprise was named the Barnet Cotton and Woolen Manufacturing Company and the initial capital stock was recorded at \$40,000. Shortly after 1825, a large seven story woolen mill was built at the upper end of the Stevens Falls and was known locally as the "Upper Mill". The building of the first textile factory was hailed as the opening of an era of prosperity for the Village. By January 1828, twenty new houses had been built to accommodate the factory workers (4).

The second woolen mill was built by the Company probably in 1830 at the lower end of the Falls and was known locally as the "Lower Mill." In 1838, the original company was reorganized by Henry Stevens, William Gleason and John Herrin with a capital stock of \$300,000. The Lower Mill was a six story wooden factory with two complete sets of carding machines, pickers and power looms. The mill specialized in white flannel and contained finishing rooms and a dye house. In addition, the Company owned several tenements for the factory operatives. Sometime around 1840, the Lower Mill was purchased or leased by Thomas and George Greenbank. In 1843, a new partnership formed by George Greenbank and James Taylor installed machinery to manufacture cassimeres, shirting, blankets and frocking (5).

In the 1830s, the sale of wool was the most important single source of Vermont farm income. Peak wool production (raw wool, not woolen cloth) was reached about 1840. In 1840, Barnet farms boasted 4,437 sheep. At that time, farmers sold raw wool to the mills or had it custom carded, woven and finished (6).

During the Civil War, the price of wool rose from about thirty cents to one dollar a pound. Both mills in Barnet Village were running to full capacity and monthly payroll was \$3,000. As the woolen mills prospered, other industries also grew in the 1860s. In spite of the "boom times", however, the Barnet Manufacturing Company, as it was known by this time, went bankrupt. In 1863, Edward Chappel of Norwich, Connecticut, purchased both factories in the village and the woolen mill in West Barnet. Chappel reorganized the company, naming it the Caledonia Manufacturing Company and employed about seventy-five people (7).

The close of the Civil War brought a decline in the price of raw wool and woolen goods. The decline in the number of sheep was especially rapid from 1840 to 1870: the total number fell from 1,682,000 to 580,000, a reduction of nearly two-thirds in the Vermont woolen industry. As was the "fate of nearly all the woolen mills in this part of New England, to be burned, sooner or later," both woolen mills in Barnet Village were destroyed. The Upper Mill burned in December 1869 and the Lower Mill in April 1871. The burning of the factories was an end to large textile manufacturing in Barnet and a blow from which the town never recovered (8).

Prior to 1870, the raising of sheep and the production of woolen cloth had been a major industry in Caledonia County that especially affected the growth and prosperity of Barnet. Based partly on the speculation that the woolen industry would prosper, Alexander Jack made plans to erect a new dye and print works in Barnet Center. In September 1870, prior to the burning of Barnet's second woolen mill, Jack purchased the old saw mill site from James Shaw.

Alexander Jack, son of William and Ann McGregor Jack, was born in Paisley, Scotland in 1810. Jack apprenticed the skills of a textile block cutter, dyer and printer in Paisley before emigrating to Lowell, Massachusetts. In 1849, a son, James Jack was born to Alexander Jack's first wife, name unknown. In Lowell, about 1851, Alexander married Janet Lackie, a native of Barnet, Vermont and had at least one child who died young. Possibly as early as the mid 1850s and certainly before 1867, Jack moved from Lowell to Milton Mills, New Hampshire (9).

In September 1867, Alexander Jack and Edward Brierly received a Federal patent for a new method of dyeing and embossing table and piano covers. At this time, Jack was a block cutter and printer at Brierly's Felting Mill in Milton Mills, New Hampshire. The felting mill processed raw wool into felt for cloaks, overcoats, table covers and lamp mats. Brierly established his business in 1850 and Jack may have been associated with him since that time. Brierly began a second felt mill east of the Salmon Falls River in Acton, Maine. Both mills were destroyed by fire in 1873 and rebuilt in 1874. (10)

Jack's 1867 patent was a wooden block-printing device that allowed several stripes or designs to be printed at once on wool cloth or felt. By this device an imitation woven pattern could be printed on flannel cloth to produce plaids. In the patent description, Jack referred to the device as a "dye-frame". In this dye frame, wool cloth was clamped in wooden strips or blocks at certain intervals to produce a design. The whole device was immersed in a dye vat and the "ground" (or parts of the cloth not clamped) were dyed a desired color. This is a resist method of printing. After each piece of cloth was dyed (with stripes or patterns of it left undyed) the undyed parts were embossed or raised. Embossing was accomplished in the same frame. Scotch plaids were printed by first clamping the wooden blocks together and dyeing the cloth. Then the cloth was turned perpendicular, re-blocked and dyed a second time to produce stripes.

Jack claimed that his invention differed from other methods used in the making of embossed or printed table cloths. Instead of printing the ground color, Jack's device dyed the ground color and thus produced a more even color throughout and on both faces of the cloth. The new process produced clear grounds with defined edges to the stripes or patterns. A combination and arrangement of "medalions" (separate color-resisting blocks) could be used with the dye-frame. The products of Jack's invention were embossed and printed table and piano covers and the very unusual woolen printed Scotch plaids (11).

Cloth samples printed on the 1867 patented dye-frame have survived. In 1874, Brierly was still using the dye-frame to produce Scotch plaids for his salesman's folders. The cloth samples are dyed with different width color stripes; browns, greens, reds and yellows. Most samples are dyed only twice to produce a three-colored plaid. The fabric is woven wool flannel and this resist printing technique is very uncommon. The printed Scotch plaids were an alternative to weaving the stripes into the material (12).

Sometime after 1867, Alexander Jack went to work in Meriden, Connecticut. He was probably a dyer and printer for the firm of Jedediah Wilcox and Company, the only woolen goods manufacture in Meriden at this time. In 1848, the Wilcox Company began making carpet bags and in 1860 added a woolen mill and dye house. Wilcox manufactured ladies' cloakings, shawls, flannels, balmoral skirts, cassimers and other woolen items. Jack's association with the Wilcox Company is only probable. Jack listed Meriden as his place of residence when he purchased the old saw mill site on the Stevens River in Barnet Center in 1870 (13).

In September 1870, Alexander Jack acquired the site of the old Goodwillie Saw Mill in Barnet Center. The one-half acre mill tract included all the land between the Peacham Road and the Stevens River and between the old tannery site and James Goodwillie's land to the west, upriver. Jack purchased the mill tract from James Shaw for \$25. On the same day, Jack purchased the old tannery site for \$100 from William Shaw of Monroe, New Hampshire and James McLaren of Barnet. Since 1847, Shaw and McLaren had operated a tanning business at this location, but by 1870 the business had failed (14).

The following May, 1871, Jack purchased the house across the road from the old saw mill site from James S. Somers for \$350. Jack, with his wife Janet and possibly his son James, moved into the house. The house was formerly owned by Lydia Harvey and stands west of the house of Nathaniel Batchelder. The house is still standing, although altered from its original construction (15).

In July, Jack purchased a small parcel (1/16 of an acre) of land directly upriver from the mill tract. Jack paid James Goodwillie \$80 for the "site of old blacksmith shop near mill dam." The shop was standing in 1865 when Goodwillie acquired it from Isaac Harriman. It was not standing as of the time Jack acquired the land in 1871 (16).

Alexander Jack purchased the mill tract and water privilege in September 1870 and possibly began construction of the Dye & Print Works in the Summer of 1871. A stereograph, photographed and published by C. Goodrich of Plainfield, Vermont, has survived. The following inscription is handwritten on the back: "The Alex Jack Mill Built in 1872." This stereograph, in excellent condition, pictures the present building (without the Blacksmith Shop on the east side) and was probably taken not long after the mill was completed in 1872. It is a rare and unusual photograph of the original construction and owners of the property. Featured in the photo are four people standing in the mill and obviously posing for the picture. Alexander Jack and his wife,

Janet, are standing in the open door on the south side of the first floor. Two young ladies are also seen looking out windows on the second floor. The photo was taken from across the road facing the southeast corner of the mill. The photo clearly shows the two story mill plus attic and cellar. The dye house, added to the west side first floor, has a large metal ventilator on the roof. (This ventilator would have allowed vapors and steam to escape from the dye vats.) There is also a brick chimney near the west wall of the main mill and a sky-light on the south side of the roof. The east elevation on the cellar level has a door near the northeast corner. A post and plank fence stands between the road and the driveway into the mill (17).

In early October 1869, the Stevens River flooded and destroyed all the dams and bridges from Harvey's Lake to Barnet Village (18). Jack would have had to rebuild or make extensive repairs to the wooden dam prior to using the water power. A vertical turbine was probably installed in the new mill. The main mill building was constructed of wood all at the same time and remains essentially intact. The two story main mill measures 30' x 40'. The mill was built with a stone foundation into the earth bank on the south side. The north side (riverside) in the cellar is constructed of wood. The west addition, dye house, measures 20' x 18'. This addition was completed at the same time as the main mill, or not long after. The earth cellar, with its stone rubble foundation on the south side, continues into the west addition. Yet it is clearly a two story addition, as the main mill is covered with clapboards on the west exterior in the cellar and on the first floor.

The first and second floor of the main mill building still exhibit the original plastered walls above the window ledges and the second floor has a plastered ceiling. Presumably this fancy interior finish to a textile mill was to keep the work place as clean as possible for the printing operations. As the mill was initially constructed then, the first floor of the main mill was a woodworking shop where Jack made and repaired his dye-frames, dye-vats, air-chambers and hydro-extractors. The second floor was a textile printing room. The west addition was a dye house with dye vats for dyeing sheep skins and woolen cloth. The Blacksmith Shop, the east addition, is not original to the 1872 construction.

The Vermont Business Directory published in 1873, listed "Alexander Jack, Dyer, West Barnet." Jack continued to use this state-wide directory as a source of advertising until 1887. F.W. Beers' County Atlas of Caledonia Vermont, published in 1875, listed "Alexander Jack, Proprietor of Dye Works, All kinds of Job Dyeing, Block Printing, etc, done promptly." A map of Barnet in the Atlas, shows Jack's residence across the road from the "Dye and Print Works" on the Stevens River. The Atlas and business notices indicate the principal woodworking and woolen industries in the many villages of Barnet in 1875. This source is very helpful in reconstructing the industrial environment at this time (19).

Alexander Jack filed a patent request in Barnet in December 1874 and it was published in the Official Gazette of the U.S. Patent Office in March 1875. Jack's patent was a "Method and Apparatus for Dyeing Wool on Sheep Skins". This device was a dye-vat for tanning or dyeing whole sheep skins. Jack claimed that the skin was kept "perfectly cool" during the operation of dyeing; thus preventing the skin from being injured. It was also claimed that the dye-liquor would remain hot during the entire operation. In this method, the sheep skin was sewn to a cloth and hooked to a movable frame under an "air-chamber." By a combination of guide brackets and pulleys, the skin was lowered in and out of the hot dye-liquor on the frame several times to get an even and thorough coloration. While out of the hot vat, cool air was forced into the top of the air chamber above the sheep skin on the frame. In this process the sheep skin was not injured by the hot steam of the dye-liquor. It was possible to keep the skin in the vat (while being cooled by the air chamber) and not always in the hot dye-liquor. Also the cool air could escape from the top of the air-chamber and not cool down the hot dye-liquor. Previous methods of dyeing sheep skins required that the skin be taken completely out of the dye vat and cooled before a second dip into the hot dye-liquor. With Jack's patented process, this was unnecessary. The skin could be dyed; cooled in the air-chamber and redyed in less time and without removing the skin from the vat each time. Also, several dye vats, containing different colors of dye-liquor could be used to receive the air-chamber in succession and the skins dyed. The same skin could thus be dyed a number of different colors. The dyed sheep skins were used as carriage and parlor mats. How extensive this business became; or if the patent was ever sold, is undetermined at this time (20).

Sometime in the early 1880s, Jack began the manufacture of "hydro-extractors." A hydro-extractor is essentially a drying machine used in the textile industry to remove excess water from yarn and cloth that has been dyed or washed. The machine consisted of a perforated copper cage or basket built around a central spindle and the whole device was housed in a wooden or cast-iron casing. The belt-driven central spindle was rotated at speeds up to 1,000 rpm, developing centrifugal force. This sent the wet cloth to the sides of the basket and extracted the excess water from the cloth. Perforations in the side of the basket allowed the liquor to escape and drain away. In about two to ten minutes, depending on the speed of the spindle, the diameter of the basket, and the size and type of cloth, the cloth was partially dried. About 50-60 percent of the water could be extracted by this method. The advantages of the hydro-extractor over the roller squeeze machine was that the cloth could be placed in the machine in a loose and free condition without pressure and there was less danger of forming wrinkles or pulling the cloth out of shape. How many of these hydro-extractors were made or exactly what they looked like is undetermined at this time (21).

Alexander Jack's Dye & Print Works does not appear on the incomplete 1880 Census of Manufactures for Caledonia County. Without diaries, journals, insurance inventories or other business records, it is difficult to estimate the extent or success of Jack's Mill from 1872 until his death in 1887. Fortunately Jack's probate inventory of 1887 has survived.

At this time; the water-powered machine and woodworking shop contained many hand tools and some large machines for woodworking. The bench tools included planes; saws; hammers; wrenches; chisels, screwdrivers and two sets of taps and dies. On the work bench was a vise; a bench-anvil and a pair of shears for cutting iron. Also listed is a portable forge valued at \$10, used by Jack for iron-working. A large "turning lathe" is valued at \$13 and includes a set of turning tools. A "boring machine" is valued at \$25 and a grindstone is valued at \$4.87. It is likely that the turning lathe; boring machine and grindstone now in the mill; are those mentioned in the 1887 probate inventory. Jack's chest of engraving tools for cutting wood blocks for textile printing was valued at \$15. There was also a chest of dye colors valued at \$5. Absent from this inventory, however, is any mention of dye-frames, dye-vats or other textile apparatus. Apparently the second floor; attic and dye house were not inventoried (22).

Jack's "Steam Dye Works" with a "never failing water privilege" was a vital local industry. At this time; there were five carriage makers or wheelwrights operating in Barnet; along with several blacksmiths and one machinist. In nearby St. Johnsbury; there were several large factories manufacturing all types of machinery, including water turbines. The well-known Fairbanks Scale Works was operating at this time and their enterprises were very extensive (23).

III. Smith; Bishop and Ford; 1887-1893

The Smith; Bishop and Ford phase in the development of the mill site begins with the administration of Alexander Jack's estate and continues until the mill was sold to J. Loren Judkins in 1893.

On July 25; 1887; Alexander Jack died at the age of 77 and was buried at the Barnet Center Cemetery. There was no will and the estate was declared intestate. Isaac M. Smith (1830-1893) of McIndoe Falls was appointed Administrator. At this time; Smith was Deputy Sheriff for Barnet and often employed in the settlement of estates. Smith served for many years as a Director of the Merchants National Bank in St. Johnsbury and at one time was President of the Woodsville Savings Bank in New Hampshire (1).

On September 27; George Blair and W. John Gilfillan both of West Barnet; inventoried Jack's Mill and house. The mill and water privilege were valued at \$800. The personal estate; including shop machinery; hand tools and barn implements; was valued at \$144. The house with one-half acre was valued at \$250 and the household goods at \$100. The total of the September inventory of Jack's estate was \$1,293.50 (2).

On October 22; Isaac M. Smith obtained a license to sell the property of Jack's estate at public auction. Smith named his friend; Ora Bishop of Barnet; the auctioneer. On the same day; by an Administrator's Deed, Smith sold Bishop the Jack property for \$150. This deed; however; was not recorded with the Town Clerk until January 23; 1888 (3).

Ora Bishop (1848- ?) operated a general store and hotel at Passumpsic and later in McIndoe Falls. At various times, Bishop held many town offices and was also Postmaster. He was a bridge director, a trustee of the Wells River Savings Bank, a fine mathematician and in "wide demand as an auctioneer." The auction of Jack's estate took place about December 1. A notice appeared in the St. Johnsbury Caledonian on December 8: "The house and mill owned by the late Alex. Jack were sold at auction last week. The property that cost thousands was sold for as many hundreds to Ora Bishop of McIndoe Falls"(4). There is something not entirely proper here with Bishop, the Auctioneer, ending up with the Jack property. On February 4, Catherine Jack, widow of Alexander, sold the Jack property to Ora Bishop by a Quit Claim Deed for \$500 (5).

The final Administrators settlement, including claims on the estate, and an additional personal inventory of the estate for \$86.36, was presented on 30 March 30, 1888. Jack was survived by his third wife, Catherine Hay Jack. They had been married at West Barnet in 1881, shortly after the death of Jack's second wife, Janet Lackie. Alexander Jack was also survived by his son, James Jack (1849-1907) who at that time was a painter in St. Johnsbury. In early June 1888, Mrs. Catherine Jack and Mrs. Lewis Henderson and child, traveled to California. They were preceded to California by Mr. Henderson a few months before. They all returned the following November (6).

Ora Bishop, the auctioneer, sold a one-half interest in the Jack property for \$500 to Isaac M. Smith, the Administrator of Jack's estate. Smith and Bishop were co-owners in July 1888 and in September, they contracted with Elmer S. Ford of South Peacham to erect a cider press in the vacant Jack Mill. Ford had loaned Smith and Bishop \$1,000 so that they might purchase the Jack property. They agreed to pay Ford six notes of \$300 each or \$1,800. They further agreed that Ford would get the deed to the Jack property, if Ford paid Smith and Bishop fourteen notes of \$50 each or \$700 (7).

Elmer S. Ford was twenty-five when he began running a cider press in the old Jack Mill. His father, Fowler S. Ford, was a carpenter and owned a sawmill in South Peacham from 1870 until 1886. In 1874, he began manufacturing sash, blinds and doors. He also sold paint, oils, and repaired glass. Fowler S. Ford moved to Cabot, Vermont in 1886 and left his son, Elmer, to manufacture butter prints in the wood-working shop in South Peacham. Elmer S. Ford married Corra Mable Libby in December 1886 and had a son, Charles Harrison Ford in August 1888. In September 1888, Ford agreed to the cider mill arrangement with Smith and Bishop (8).

While there were no cider mills in Barnet in 1887, cultivated orchards and wild apple trees supplied seven cider mills elsewhere in the County (9). In the Fall 1888, Elmer S. Ford installed a wooden screw-drive cider press in the old Jack Mill. The press was operated manually and an apple grinder was powered from the line shafting. In fact, little is known about the mill during the period 1888-1893. The mill was probably used as a seasonal cider mill. The cider press was still in the mill in October 1893 (10).

IV. Judkins Wagon & Woodworking Shop; 1893-1947

During the Judkins phase in the development of the mill site, the Blacksmith Shop was added and the main mill was used primarily as a Wagon and Woodworking Shop.

James Loren Judkins was born in Danville, Vermont in 1834. He operated a saw mill and apprenticed the carpenter's trade from David Morse of Danville. Upon his return from a brief trip to Illinois, he helped build the Academy and South Hall in St. Johnsbury. In September 1870, Judkins married his third wife, Mary Jane Lindsay of Danville. In 1875, he acquired the carriage and general repair shop in South Peacham, built by Lewis Gilson in 1855. Judkins was a versatile craftsman serving occasionally as village blacksmith, wheelwright, carpenter and cooper (1).

J. Loren Judkins' Wagon and Wheelwright Shop was located on the South Peacham Brook in the center of the village. In 1880, the shop was invested with \$2,000 in capital. Judkins operated on ten-hour days throughout the year and employed one man and one boy under the age of sixteen. He paid a skilled worker \$1.75 per day and an unskilled worker \$1.00 per day. At this time, the total wages for the year were \$400. The iron, wood and carriage hardware purchased by the shop amounted to about \$400 a year. The total value of goods produced by the shop for the previous year was \$1,150. The woodworking machinery operated on water power supplied by one fifteen-inch Leffel water turbine. The turbine ran under eighteen feet of head and produced about twenty horse power (2).

In October 1893, Judkins purchased the Jack property in Barnet Center. The mill was probably in use at this time as a seasonal cider mill. It is likely that Judkins wanted to expand his operations into a larger shop. The property, including water privilege, machinery, mill tools and cider press, as well as the house across the road, were purchased in his wife's name, Mary Jane Judkins. One-half interest in the property was acquired from Ora Bishop for \$300. The other half interest was acquired from the estate of Isaac M. Smith for \$300 (Smith had died the previous January). For a total of \$600, Judkins obtained a valuable water privilege, mill and house. Now all he needed was a blacksmith shop and he could begin a business in Barnet Center (3).

In the Spring 1894, at the age of sixty, J. Loren Judkins, with his wife and two sons, Fenton and Donald, moved into the house. Judkins brought the essential wheelwright's tools from the shop in South Peacham. Judkins introduced some wood-working machinery into the shop. It is known that he brought the spoke lathe and possibly the belt sander and the wood-framed table saw now located in the shop. From 1893 until 1947, the mill was known locally as Judkins Woodworking Shop and was involved mostly in general carriage and wagon repair work (4).

The Blacksmith Shop; the east addition to the mill, was added sometime in 1894 or 1895. The shop was originally built on the Joseph Goodwillie Farm located across the Stevens River. Goodwillie, a blacksmith and gunsmith, used the forge in his work. His son, James Goodwillie, operated a saw mill on the present site from 1837 until c. 1855. The old Goodwillie Farm was owned by John Manning when Judkins purchased the Blacksmith Shop; disassembled it and moved it across the river to the mill site. It was moved to the east end of the main mill and altered somewhat. A concrete foundation was poured against the east exterior wall of the main mill and for the south and east cellar walls of the new shop. The cellar door (original construction) was used as an entrance into the cellar of the new addition. One door was cut into the east elevation of the mill (formerly a window on the first floor) to provide an entrance to the forge area. A front door was added to the first floor of the Blacksmith Shop and a back door added the the north wall. The back door leads down a flight of steps to the cellar level or outside to the river bank. At this time, a new brick chimney was built for the forge (5).

J. Loren Judkins died in April 1900 and his two sons, Fenton age nineteen and Donald age seventeen, carried on the business as a partnership until 1905. In January 1905, Fenton married Jennie B. Wallace of East Barnet and in June, Donald married Lottie E. Roy of Barnet. At this time, Fenton and Donald dissolved the partnership and in September, Fenton was deeded the mill, house and a barn from his mother for \$1,000. From 1905 until 1947, Fenton Judkins was the sole proprietor of the Woodworking Shop (6).

Don Judkins acquired the Pioneer Electric Light Company from Arthur Hunt in 1907. The company was originally organized in Barnet Village in 1894 to supply electricity for residential areas and public street lights. In 1907, the plant was closed and in very poor condition. Don Judkins rebuilt the penstock and purchased a pair of fifteen-inch twin wheels from the Rodney Hunt Machine Company in Orange, Massachusetts. In November, the Barnet Electric Light and Power Plant was back in operation. In January the first power plant burned and was rebuilt, using the same Rodney Hunt water turbines. Based on the success of the electric light plant in Barnet Village, Judkins decided to run lines to Monroe, New Hampshire and to East Barnet, West Barnet and the Peachams. At this time, Don Judkins was a contracting electrician. He installed poles and wires in homes and to many outlying farms (7).

In 1911, the water power system in the Judkins mill was rebuilt. Fortunately the original blueprint for the turbine installation has survived. A Rodney Hunt horizontal turbine was installed in the cellar in approximately the same place as Alexander Jack's vertical turbine. A round penstock was built to replace the original square penstock. The wooden staves for the new penstock were made upstairs in the woodworking shop. At this time, the particular construction of the dam allowed sixteen feet of head water. The blueprint specifications stated that the center of the wheel should be set at least four and one-half feet below the top of the dam. At this level, the new turbine was estimated to achieve about 30 hp. There was

blasting on the rock ledge in the cellar to provide room for the draft tube. New concrete bearing supports were poured for the main drive shaft that runs from the back of the horizontal turbine. All the line shafting in the mill was powered from this main drive shaft (8).

There were at least two reasons for installing a new turbine at this time. The old vertical turbine was forty years old and probably not producing sufficient power to run the new machinery that Judkins had put in the mill. Secondly, the mill was to become an auxiliary power station to add electricity to Don Judkins' electric company. Don Judkins began setting out new poles in front of the mill and to West Barnet and the Peachams in the Summer of 1911 (9).

At this time, electric milking machines were coming into use on the farms in Barnet. The milking schedules were all the same: early morning and late afternoon. Twice during the day there was a large demand for electricity. The generators in the power plant in Barnet Village were not able to supply the large demand. In 1911, Don Judkins installed a generator in the mill in Barnet Center to 'boost' the electric output at the critical milking times on the farms. The first generator installed in the mill has powered off the main drive shaft from the new horizontal turbine. The water power, however, was not always constant and the first generator was often out of use. In 1913, a second generator, driven by a kerosene engine, was used to supply electricity. The manufacture of the first engine is unknown. The engine presently in the cellar of the Blacksmith Shop dates from 1923 (10).

In November 1915, Don Judkins removed his electric power plant to a larger mill at the foot of the Stevens Falls in Barnet Village. He operated the business here very successfully until 1917 when the Eastern Vermont Public Utilities corporation purchased the works. (From 1917, the Judkins Mill in Barnet Center produced and used its own electricity.) At that time, the Judkins plant was connected with a circuit of plants in West Danville, Groton, Boltonville and elsewhere. Judkins continued in business as an electrical contractor for the utility company. During the 1920s, Don Judkins built several houses in Barnet Village. Judkins also engaged in the automobile and trucking business until his death in 1928 (11).

About 1916, the Judkins house, across the road from the mill, became the Central Office of the Barnet Telephone Company. A central switchboard in the living room was maintained by members of the family. Business increased to such an extent that a girl was hired to operate the switchboard. At this time, a telephone extension was also installed in the mill and it is still in place (12).

About 1915, Fenton Judkins installed the cider press now located in the cellar of the west addition (old dye house). This addition has since been known as the Cider Mill. Fenton's father acquired a wooden screw-drive cider press when he purchased the mill in 1893. The old cider press was installed by Elmer S. Ford in 1888 and probably used up until c. 1915 when Fenton Judkins installed the new hydraulic press. The press was probably purchased

in used condition. The press was manufactured by the Boomer & Boschert Press Company of Syracuse, New York and has no patent date. The apple grinder, also made by Boomer & Boschert, is patent dated May 16, 1881 and April 13, 1881. The press head operates hydraulically, under water pressure. The apple grinder is powered from a separate jack shaft. The third line shaft in the main mill extends into the cellar of the Cider Mill. A Fairbanks Morse scale and wooden apple hopper are located on the first floor of the Cider Mill. At this time, Judkins also installed a large cider storage tank and a smaller tank for evaporating cider into cider jelly (13). Shortly after acquiring the cider press, Fenton Judkins purchased a steam boiler and located it in the cellar of the main mill. The steam boiler was manufactured by the Ames Iron Works of Oswego, New York. Judkins probably purchased the boiler in used condition. The steam boiler is featured in the 1894 Fairbanks Morse Catalog. At the time of the boiler installation, the floor, just inside the front door of the wagon shop, was cut and removed so that the large boiler could be lowered into the cellar. The wood-fired boiler generated steam, not for an engine as pictured in the 1894 Fairbanks Morse Catalog, but rather for the cider evaporating tank in the cellar of the Cider Mill. The boiler also supplied live steam through pipes to the steam box located on the roof of the Cider Mill. Access to the steam box was gained through the west wall on the second floor of the main mill. The boiler, cider evaporating tank, pipes and steam box are still in place (14).

About 1918, Fenton Judkins constructed a barn and a lumber shed just north of the mill. The barn (now demolished) was removed from a local farm and used by Judkins to store farm implements. The lumber shed (now demolished) was built at the corner of the mill. The two story 23' x 45' shed was used to store wood and wagons.

Sometime after 1900 and before 1938, Fenton Judkins added a number of wood and metal working machines to the mill. He added a small drill press, band saw, jointer, surface planer, and the metal lathe, now all located in the shop. (Much of this equipment was not purchased new, as it pre-dates 1900). During this period he acquired a trip hammer and installed it in the Blacksmith Shop. Following the November 1927 flood, he purchased the power threader used in the machine shop at the Roy Mill in East Barnet.

Work at Judkins' Woodworking Shop consisted of general wagon and farm implement repair. At various times, snow rollers, water tubs, wagon bodies and traverse sleds were manufactured here on a custom order basis. Work tended to be seasonal, and generally all the rural industries, including logging, surgaring, framing, etc. were dependent on the shop for repairs.

V. Ben Thresher's Mill, 1947-1979

Benjamin A. Thresher, son of Charles W. Thresher and R. Lillian Wilson, was born October 12, 1912 in Peacham, Vermont. During the 1930s, Thresher held various jobs as a blacksmith and driver of horse and ox teams. Thresher began working with Fred Fields, a blacksmith from McIndoe Falls, logging the

trees that had fallen in the hurricane of 1938. In April 1941, Thresher married Emily L. Hubbard and on July 4, 1941, began working for Fenton Judkins in the Woodworking Shop. For six years Thresher expanded his knowledge of the wheelwright's trade before purchasing the mill and property on February 18, 1947. The property was mortgaged for \$3,500 at the Citizens Savings and Trust Company in St. Johnsbury. In May 1947, Ben Thresher and his family moved into the house. Since 1947, the mill has been known locally as Ben Thresher's Mill and the business has been general wagon repair and woodworking (1).

Ben Thresher rebuilt the round wooden penstock c. 1949 and in the early 1950s added several tools to the shop. He acquired a large manual-feed drill press to replace the small automatic-feed drill press used by Fenton Judkins. Thresher brought his own anvil to the shop and acquired the bench threader from a blacksmith shop in Ryegate Corner. The John Deere crawler tractor was also acquired in the early 1950s. The gas-powered crawler can be positioned in the driveway and can power the mill in times of low water or when the dam or turbine are being repaired.

When Ben Thresher operated the Cider Mill he usually charged twenty-five cents per bushel for pressing or took apples in payment. He pressed some for home use and his children sold gallons by the side of the road on nice fall afternoons. Thresher stopped operating the cider press sometime around 1965 for several good reasons. Small apple orchards were disappearing from local farms, and many people were bringing in quantities of apples that were too small to warrant running the press. Also, fall was an especially busy season for wagon repair work in the shop. Valuable time could not be spent in both places. The Cider Mill could have continued if someone had been willing to operate it as a small business. This would have required buying apples, pressing the cider and finding a market for it. With custom repair work piling up in the shop, Thresher decided to stop pressing cider every fall (2).

Since 1947, Ben Thresher has provided a valuable service to local farmers, carpenters and craftsmen in repairing their tools and constructing nearly anything they might need made of wood or metal.

VI. Power Transmission

In 1836 a dam was first built here and a saw mill operated on this site from 1836 until c. 1855. The type of construction of the first wooden dam is unknown. It was possibly similar to the present timber frame and plank dam. In 1872 a wooden dam was built and a vertical turbine with a square penstock was installed. The first turbine was replaced in 1911 with the present Rodney Hunt horizontal turbine. The present dam has been repaired many times. It was not entirely destroyed even in the 1927 flood which caused extensive damage all along the Stevens River.

The present timber frame and plank dam is 135' long including 40' of stone under the north end. This additional support prevents the swampy end of the mill pond from washing out. It is not known when the stones were put

here. The wooden dam is constructed of heavy timbers; trees or beams and planking; hemlock or tamarack lumber. Upright timber supports are pinned into holes drilled into the rock ledge of the Stevens riverbed. The height of the dam varies from 5' at the north end to 10' at the south end near the gate. Small cracks between the planking are filled with clay or clinkers from the forge. Later, after the gate has been lowered, river silt will fill in the cracks and allow only minor leaks. The wooden gate is raised and lowered by hand. When the gate is lowered, the river begins to back up and creates a mill pond behind the dam. Water is free to flow through a wooden trash rack at the northwest corner of the mill. At this point, water falls into a wooden pit and enters the penstock. In the Summer of 1979 the dam was repaired and there is about 14' of head water.

The first ten feet of the round penstock is a sixty-inch diameter steel boiler, with the ends removed. The last thirty feet is a wood-stave penstock that delivers water into the turbine. The penstock is thirty-six inches in diameter and is strapped together with iron rods.

The 1911 horizontal turbine has a cast-iron case, and the eighteen-inch runner turns in water-lubricated wooden bearings. The turbine is a "left-hand" type, meaning that the runner turns counter-clockwise as the water enters. Water flows out a thirty-inch diameter draft tube which is nearly eight feet long and empties out the bottom of the tube onto the rock ledge and into the river. The main drive shaft runs out the back of the horizontal turbine and rests on concrete bearing supports.

All the line shafting in the mill is powered from the main drive shaft. The turbine can be opened from a wheel control on the first floor (near the surface planer) or from a small hand control in the cellar. The main drive shaft (3" diameter) from the turbine turns a forty-inch wooden flywheel. The large flywheel is engaged with a belt tensioner manually activated from upstairs near the surface planer.

Three line shafts drive the machinery upstairs in the mill. The first (north) line shaft powers the pattern lathe, belt sander, power threader and engine lathe, all located along the north wall on the first floor. The second line shaft powers only the wood planer located in the middle of the shop. The third line shaft powers the jointer, both table saws, band saw, wood lathe, grindstone, drill press, boring machine, trip hammer and the cordwood saw (located outside the mill on the south wall). All machines are belt driven from pulleys on the three shaft lines in the cellar. The third line shaft is extended into the Cider Mill and powers the apple grinder and the hydraulic mechanism. There is no power machinery on the second floor or in the attic.

The 1923 six-cylinder Studebaker engine has a fly-ball governor to regulate the speed. The engine is still in place in the cellar of the Blacksmith Shop. It was used to power the mill in times of low water or repairs but is no longer in use. The John Deere crawler tractor can be employed to power the mill. It sits in the driveway and from its power-take-off a long belt runs to a pulley on the main shaft in the cellar of the Blacksmith Shop.

VII. Wagon & Woodworking Shop

At the turn of the century, automobiles were a rare sight on Vermont country roads. The horse and buggy was still the chief means of transportation. Wagons, buggies and sleds were factory-built and carriage making was a specialized trade. Wagon repair shops and wheelwrights were located in nearly every community. Judkins Wagon & Woodworking Shop was furnished with tools and machines to repair broken wheels, set new tires, rebuild wagon bodies and mend an assortment of agricultural implements.

The Wagon & Woodworking Shop, on the first floor of the main mill, contains the principal hand tools and water-powered machinery for wagon repair work. Alexander Jack operated a machine shop here from 1872 until 1887. Some of his hand tools have probably survived. It is likely that the wood lathe, grindstone and boring machine date from this period. Jack also had a portable forge for iron-working. J. Loren Judkins established a Wagon Shop here in 1893. It is likely that he brought the spoke lathe, belt sander and wood-framed table saw with him from South Peacham. The crane, wood bender and paint grinder, located on the second floor, probably date from the early Judkins period. After 1900, Fenton Judkins added a small drill press, iron-framed table saw, band saw, jointer, planer, metal lathe and power threader. After 1947, Ben Thresher added another drill press and the bench threader.

Repairing wheels was the most common task for the wheelwright. Wheelwrights chose woods that combined strength with the least weight and long life in the weather. Elm was preferred for wheel hubs, oak for spokes and white ash for felloes. The flexible, wiry ash was easily steam bent to the curve of a wheel. The felloes and spokes were the parts of a wheel most likely to break. Fortunately the Vermont woods abounded in oak and ash. The life expectancy of a wheel depended on its being as tight as a drum. Each spoke had to fit the hub snugly and each of the felloes had to grip the end of the spoke like a vise. A good wheel, bound with an iron tire of just the right size, was as solid as a single disc of wood. Tire benders and shrinkers were used to adjust the correct length of iron tires of the wooden wheel. Great skill was given to making frames, bodies and boxes for farm vehicles (1). Wagon repair work was not confined to the first floor. Iron tires, springs and other hardware were fashioned in the Blacksmith Shop. Tire setting was done outside in the drive way. This description of the Wagon & Woodworking Shop is primarily limited to power machinery, not to the numerous hand tools and devices used by wheelwrights.

The wood-framed spoke lathe in the northwest corner of the first floor is possibly the oldest tool in the Wagon Shop. The wheelwright turned wagon wheel spokes from wooden patterns. Irregular shapes of wood up to 3' long, including handles for all kinds of tools, could be turned on this lathe. Numerous examples of the machine's products are exhibited on the shelves hung from the ceiling. Spokes and handles were finished on the 6" belt sander wall-mounted next to the pattern lathe.

The large wood-turning lathe has a four and a half foot bed and is used principally for spindle and faceplate turning. The headstock and tailstock have each been raised so that a square block up to 24" can be turned round. The headstock operates on a four step speed pulley. Driven from one step of the same pulley that drives the wood lathe is a grinding tool mounted on an iron table. The grinder is double-ended and can run two 12" emery wheels.

The wood-framed boring machine is an indispensable wheelwright's tool. It is used principally to drill holes in felloes and hubs. With hollow augers or cutters the machine can finish the round ends of spoke tenons. The drill bit is foot-operated when drilling. The height of the wooden stock being drilled is adjustable.

The wheelwright's frame, wheel-bench, or horse is a 3' high wooden cone strapped with iron bands. It is essentially a vise for repairing wagon wheels. Wheels to be repaired are laid flat on top of the frame. An iron bar is inserted through the hub and is tightened to an eyebolt, permanently mounted in the floor. In the vise, the wheel is held firmly while being dismantled and rebuilt.

The drill press is a "No. 16" manufactured by Canedy Otto of Chicago Heights, Illinois. It is mounted to an upright beam and has a manual-feed operation. It was purchased by Ben Thresher c. 1950 because he preferred a manual-feed operation to the smaller Canedy Otto automatic-feed drill press previously used in the shop. The smaller Canedy Otto drill press is now located in the Cider Mill and is not in use.

The placement of the machines in the shop is not haphazard. The wood-framed table saw measures 4' square. To cut wood planks longer than 12', the operator must open a window on the north wall. The window and the front door must be opened to cut wood over 16'. A one-inch arbor operates on a two-step speed pulley and drives a blade up to 18" in diameter. The table saw can also be used as a dado or groove-cutting device. The iron-framed table saw was possibly manufactured by L.D. Howard of St. Johnsbury, Vermont. This table saw can run up to a 14" diameter blade. The blade can be angled for cutting the edges of wheel spokes. Half of the iron table slides back and forth and allows wood stock to pass by the blade easily.

The iron-framed band saw is patent dated 1883, 84 and 86 by F.H. Clement of Rochester, New York. The iron frame is a pitch-back design common to 19th century band saws. This style allows a 34" circle to be cut on the 32" square table. The band saw can be adjusted to cut wood stock up to 10" thick.

The surface planer is patent dated May 21, 1878 by the Baxter Machine Company of Lebanon, New Hampshire. It is located in the middle of the shop opposite two windows. They can be opened to accommodate the planing of boards in excess of 16'. The planer is belt-driven with a two-step pulley. A main

pulley drives two 24" steel knives. A two-speed corrugated roller on the front automatically feeds the boards into the knives and through the planer. To adjust the planing height, the operator can turn a small wheel to raise and lower the bed. Boards up to 8" thick can be planed on this machine.

The wood jointer "No. 1609" is patent dated January 25, 1870 and was reissued in 1874 and 1875 by W.W. Carey of Lowell, Massachusetts. The jointer has one pulley for driving two 16" knives used principally to cut chamfers, bevels, tapers and rabbets. Wood over 10' is extended out a hole cut in the north wall of the Wagon Shop. The jointer is painted red and has an elaborate yellow hand-scroll trim.

The hand-operated bench threader is used principally in tap and die work. The threader is possibly a Champion and the bench is custom made. The power threader was manufactured by Lucius W. Pond of Worcester, Massachusetts. Fenton Judkins moved the machine here from East Barnet when the Roy Mill was destroyed in the flood of 1927. The power threader is located on the north wall and is driven from a separate jack shaft mounted on the ceiling. It is commonly used for threading pipe for silo hoops, water tub hoops and spring clamps. When 20' silo hoops are threaded, they are extended out a hole in the east wall of the Wagon Shop. This machine dates between 1875 and 1888. Pond's machine tool company was incorporated in Worcester in 1875 and in 1888; Pond joined Niles and Bement in Plainfield, New Jersey (2).

The metal lathe was manufactured by Gage, Warner and Whitney of Nashua, New Hampshire. Their shop was established in 1837 (3). The lathe is located on the north wall and is driven from a separate jack shaft on the ceiling. It has a three-step cone pulley, a 3' bed and a 12" swing. The metal lathe is used principally in turning down metal rods, facing, drilling, boring and cutting threads.

Bending wood with steam was an important part of a wheelwright's job. Prior to c. 1915, Fenton Judkins used a wood stove in the cellar of the Blacksmith Shop to heat large pans of water for steam. Judkins acquired a steam boiler c. 1915 and installed it in the cellar of the main mill. The boiler was manufactured by Ames Iron Works of Oswego, New York. The wood-fired boiler generated steam for bending wood in the steam box located on the roof of the Cider Mill.

The second floor of the Wagon Shop was an area where wagons were repaired and painted. The large wood bender forced steamed wood into desired shapes. Judkins used the machine mostly for sled runners for traverse sleds. The crane, or hoist with wood pulley blocks, is still in place near the door on the second floor. Wagons and sleds were carefully raised and lowered by hand. There are numerous paint cans on the work bench along the north wall in the paint room. The paint grinder was used to mix old and new paint or to add pigment to new paint. There are wagon manufacturers labels nailed to the frame of the door leading into the storage room.

The Lumber Shed, now demolished, stood at the southwest corner of the mill. The two story shed (23' x 45') held seasoned wood and protected wagons and tools from rain and snow.

VIII. Blacksmith Shop

The Blacksmith Shop was added to the east end of the main mill c. 1895. J. Loren Judkins purchased the shop from the John Manning Farm (old Goodwillie Farm) located north across the Stevens River in Barnet Center. During the Revolutionary War, Joseph Goodwillie served as a gunsmith in the British Army. In 1792, he moved to Barnet and brought his family the following year. He purchased the farm from his brother, the Reverend David Goodwillie. Joseph Goodwillie possibly built a blacksmith shop on his farm shortly after 1793. This is the same shop that was purchased c. 1895 and reassembled on the east end of the present mill. It is possible that the shop is about 185 years old (1).

The Blacksmith Shop measures 19' 8" by 17' and is constructed of heavy beams and siding. The shop consists of one floor, the forge area and a cellar. There is currently a metal roof. It is beyond the scope of this chapter to discuss the art of blacksmithing; this description is limited to the major iron-working tools in the shop in the summer of 1979 (2).

When the Blacksmith Shop was reassembled at this site, a new brick chimney was built on a concrete foundation. The forge table measures 4' square with bricks for the fire-bed. A clean-out box for ashes and a water tank for wetting blacksmith coal are under the forge bed. The forge was originally powered by a large wooden bellows, now removed. The forge is currently fired by an electric blower manufactured by the Canedy Otto Manufacturing Company of Chicago Heights, Illinois. Electric lines were first run on the road c. 1903 and the blower may have been installed at that time. The electric blower is located in the cellar of the shop and can also be driven by water power. It is a type known as a rotary 'squirrel-cage' blower, which is essentially a series of fans mounted on a wheel. Air is directed through a sheetmetal pipe upstairs to the forge area. On the left side of the chimney is a wooden damper box where the exact amount of air can be manually controlled before entering the bottom of the forge. The purpose of the blower is to force air into the soft coal fire on the forge bed. Fumes and exhaust smoke rise from the forge and enter a metal deflector about half way up the right side of the chimney (3).

The anvil is located near the forge and the manufacturer is unknown. It weighs about 130 pounds, measures 25" long and has a single horn. The anvil, with two hardy holes, is fastened to a wood block that is bolted to the floor. The "hitting edge" on the face of the anvil is 30" from the floor. The height of the hitting edge is critical. The smith should have the face of the anvil reach the knuckles of his hands as they hang by his side. This

critical height allows him to use the power of gravity and the full weight of his hammer on his work without straining or bending his back. The present anvil was brought to the mill by Ben Thresher and replaced a 250 pound anvil used by Fenton Judkins (4).

The cast-iron cone mandril is portable and its manufacturer is unknown. It is hollow, 4' high with a 1' base. The mandril is employed when welding hub bands, rings, hoops and stake bands. Running along the side is a tapered groove, employed when welding a ring into an eyebolt (5).

The swage block is 15" square and sits on an iron table near the anvil. Its manufacturer is unknown. The cast-iron block has numerous holes (round, square, rectangular, triangular & hexagonal) and tapered edges. The swage block is used to shape and draw hot iron rods into specific sizes and shapes (6).

There are two spring-post bench vises mounted on the work bench near the south wall. Their manufacturer is unknown. One vise has 6" jaws and the other has 3" jaws cut from original 5" jaws. The vises are cast steel and set at a working height where the smith can file, cut, bend, twist and hammer metals into desired shapes (7).

The caulking vise is a "Green River No. 3" manufactured by the Noyes Foundry Company of Greenfield, Massachusetts. The vise is portable and foot-operated. It is used to hold horseshoes while welding on the toe caulks. It also has a die box with attachments for making the heads for iron bolts (8).

The hand shear is a "Little Giant, No. 2" manufactured by the Little Giant Punch and Shear Company of Sparta, Illinois. The hand-shear has a seven and a half inch blade for cutting cold or hot steel. It can also be used to punch holes in hot iron. It is mounted on a wooden block that is bolted to the floor (9).

The trip hammer was possibly manufactured by L.D. Howard of St. Johnsbury, Vermont. The machine has no name or numbers and the Howard association is oral history. The hammer is located in front of the coal bin near the west wall of the shop. The water-powered trip hammer is driven from the east end of the third line shaft in the cellar of the Blacksmith Shop. The trip hammer is foot operated, which allows the smith to hold a heavy iron bar with both hands while the hot bar is being molded under the weight of the large hammer. The hammer delivers a forceful blow to the metal many times greater than can be done with the smith's own strength and thus is a great labor-saving tool. The height of the base is adjustable and there are interchangeable dies and a punch (10).

The wall-mounted tire shrinker is possibly the oldest tool in the shop. It is mounted on the north wall and the inscription "F C No. 3" is legible. It is painted green and further cleaning may reveal more identification. With

the tire shrinker; the smith can grab hot flat iron tires within its jaws and shrink the length of the tire. It is no longer in use having been replaced by the Champion tire shrinker (11).

The Champion tire shrinker "No. 2" was manufactured by the Champion Blower and Forge Company of Lancaster, Pennsylvania. It is portable and has iron wheels. A tire can be set on edge between the jaws of the shrinker and the smith can turn the large hand wheel to move the base into the hot tire and shrink its length (12).

The tire bender; now located near the front door of the Wagon Shop, was once located in the Blacksmith Shop. It is bench-mounted and is possibly a Champion. The bender is crank-operated. Hot iron up to 8" wide can be rolled in the tire bender. It is used mainly to form silo hoops, water tub hoops and wheel tires (13).

The wall-mounted nut remover is located near the door leading into the main mill. It was manufactured by the National Steam Pump Company of Upper Sandusky, Ohio. It is patent dated "Nov. 8, 98." The tool was used to remove nut heads from buggy tire rims.

The wood stove in the Blacksmith Shop is located near the southwest corner. It has "No. 30" cast on the loading door and will hold a 24" log. Its smoke pipe extends up and across the ceiling of the shop and vents out the chimney near the east wall. The wood furnace; near the southeast corner in the cellar; is the main heat source for the mill. A smoke pipe extends up through the first floor and runs across the ceiling in the Wagon Shop to the chimney located near the west wall. The cordwood saw is belt-driven from the third line shaft in the cellar. It is operated outside of the mill and wood is thrown into the cellar to feed the wood furnace.

IX. Cider Mill

Since about 1915; the west addition to the main mill has been known as the Cider Mill. Fenton Judkins installed a hydraulic cider press in the cellar and a weighing scale on the first floor. From the existing Boomer & Boschert cider press and the other cider making machinery it is possible to explain the flow of apples from weighing scale to cider barrel.

The custom grinding of hard winter apples into cider began each year around the first of October. After a good frost; the apples were ready for crushing into apple juice or cider. Freshly squeezed apple juice is called "sweet cider". If it is permitted to ferment and produce alcohol; it is called "hard cider". It was claimed that orchard apples combined with wild uncultivated apples made a good cider mixture. It was also common to mix two or more varieties of apples; such as sweet and sour or hard and soft; to create the best flavor. Apples contain as much as eighty percent juice. A bushel of apples could be reduced to about three and a half or four gallons of cider; depending on the juice content of the variety. It took from twelve to fifteen bushels to make enough cider to fill a fifty gallon barrel.

For storing cider throughout the winter, the most desirable barrels were once used oak-charred fifty gallon whiskey barrels. Molasses barrels were also good for cider; but vinegar barrels had to be steam cleaned so as not to affect the taste of cider. The best containers were "wet kegs" for liquids; not "dry kegs" for flour. The dry kegs were too thin and would not hold water.

Apples usually arrived at the mill in burlap bags. The customer's apples were deposited into the large wooden hopper on top of the Fairbanks Morse scale on the first floor. After weighing, the apples were dropped through the bottom of the scale into the apple grinder. The grinder is located near the ceiling in the cellar.

A hand lever allowed the cider press operator to feed the power grinder with fresh apples. In the cellar, a separate jack shaft held two belt-pulleys which turned the drum or cylinder of the apple grinder on either side. Inside the grinder is a rotating drum with toothed knives that chop the apples into a fine pulp or "pomace". Pomace consists of freshly ground apples, skins, seeds and juice.

On the grinder, a weighted top board held the apples firm against the rotating drum. There was a safety device to protect the knives on the drum. If a small stone or piece of metal was in the new batch of apples entering the grinder, a blade would feel the stone and raise the levers. This allowed a few apples, with the stone, to fall directly into the pomace without being ground. This prevented the knives on the drum from being destroyed.

The freshly ground pomace was collected on the bed of the press in open-meshed burlap cloths called 'cheeses'. Just enough pomace was allowed to fill the burlap cloth and it was folded over in a removable wooden frame to form a bag. The wooden frame was removed and a wood rack placed on top of each cheese to hold the bag together. The racks provided room for the juice to flow out of the pile while being pressed. When the pomace and racks had reached a height of about two feet, the whole pile on the bed was swung around on rollers to the other side of the press directly under the pressing head. The cider press has two oak beds or platforms on either side, which allow the operator to stack cheeses on one side while pressing fresh cider on the other.

The head of the cider press is operated hydraulically. A reservoir tank fed water under pressure through pipes across the ceiling to the top of the press head. Water pressure forced the heavy iron press head down toward the bed. There is also a safety valve in the reservoir tank which released water from the pipes when the pressure was too great. The device released water pressure and stopped the press head from pushing down too hard on the iron rails. The press head was manually activated by a belt tensioner on the main pulley to the standing press. When the press head was activated, it pushed down on the racks and cheeses and squeezed out the juice. The two beds

travelled on rollers. The rollers were designed to retract on springs under the weight of the press. This action allowed the press head to squeeze the cheeses on the bed down to heavy iron rails (and not on the rollers) for a firm press.

The juice ran into a large copper tank under the beds. The tank holds about half a barrel or twenty-five gallons. Since one pressing could yield as much as fifty gallons, the cider had to be immediately pumped to a storage tank. A homemade tire pump was adapted for this purpose and the cider transported from the copper tank in the cider room through a pipe to the storage tank upstairs. The copper-lined storage tank, which hangs from the ceiling on the first floor, holds about one hundred gallons. There is a strainer in the tank and the fresh sweet cider was drained into customer's barrels.

On a good day the cider mill could turn out four barrels of apple cider per hour. After each day of pressing, the burlap cloths and racks were cleaned of excess pomace with a water hose connected to the side of the wooden penstock. The pomace was thrown in the river and was a favorite treat of local muskrats. The tanks and pipelines were flushed with clean water.

The Wagon Shop kept spare cider barrels around in case someone wanted to buy one. Since they were in the business of making water tubs, they were often asked to repair barrels and replace missing staves and bung pegs.

The Cider Mill had a local reputation for its fine "boiled cider" and "cider jelly". The process of boiling cider is similar to making maple syrup. When fresh sweet cider is boiled it reduces to boiled cider and is used as a flavoring in the cooking of pies and meats. If boiled cider is further reduced by more boiling, it achieves the right consistency and is called cider jelly. A wooden evaporator box hangs from the ceiling in the cider room. In the evaporator are steam pipes fed from the steam boiler located just a few feet away in the cellar of the main mill. About seven gallons of sweet cider were reduced by evaporation to just one gallon of cider jelly. The cider jelly was packaged in glass jars and was especially popular with the local cooks.

At one time, Fenton Judkins had planned to install a second water turbine just to drive the cider press. Judkins never installed a second turbine, but the hole is still in the concrete foundation.

The cider press and apparatus for operating the Cider Mill are still in place. The press, grinder, scale, tanks and cider evaporator are as they were when operations ceased about fifteen years ago.

Footnotes

I.

1. Frederic P. Wells; History of Barnet, Vermont (Burlington, Vt.: Free Press, 1923), pp. 2-3
2. Ibid., pp. 7; 19-20.
3. Ibid., pp. 22; 35; 82.
4. Ibid., pp. 90; 204.
5. Ibid., pp. 107; 111; 117; 123; 528.
6. Barnet Land Records; Deed Book 11, pp. 266; 314.
7. Deed Book 15, p. 261.
8. Wells; pp. 82-84; 371.
9. Ibid., p. 465; Deed Book 11, p. 374.
10. Wells; p. 128.
11. Census of Manufacturers; Caledonia County, 1850, State Archives, Montpelier, Vermont.
12. Wells; p. 85; Deed Book 22, p. 261.
13. Wells; p. 256.

II.

1. "Barnet: A Prosperous Many Villaged Town" St. Johnsbury Republican, 4 March 1896.
2. Kenneth H. Atwood; "Sheep Husbandry in Vermont" (Burlington, Vt.: Vermont Agriculture, Bulletin No. 13, 1912), pp. 10-16.
3. Wells; pp. 89-90; 204.
4. Ibid., pp. 204-206.
5. Ibid.
6. Thurston M. Adams; Prices Paid by Vermont Farmers for Goods & Services Received By Them For Farm Products, 1790-1940; Wages of Vermont Farm Labor, 1780-1940. (Burlington, Vt.: Vermont Agricultural Experiment Station, Bulletin No. 507, 1944), pp. 150-151; Harold R. Wilson; The Hill Country of Northern New England (New York: Ames, 1967), p. 81.
7. Wells; pp. 204-206.
8. Ibid.
9. Barnet Vital Records; Book I, pp. 71; 77; II, p. 119; Wells; p. 521.
10. D. Hamilton Hurd; History of Rockingham & Strafford Counties, New Hampshire; pp. 653-654; Edward Brierly & Son's Felting Mill, Acton; Maine; Barlow Insurance Company Drawing, 1874.
11. Letters Patent No. 69,098 September 24, 1867; U.S. Patent Office.
12. Salesman's Folder; Accession N. 75.71 & 75.72, Textile Collection, Merrimack Valley Textile Museum, N. Andover, Massachusetts.
13. C. H. S. Davis; History of Wallingford, Connecticut, pp. 484-486.
14. Deed Book 22, pp. 261; 620.
15. Deed Book 23, p. 292.
16. Deed Book 21, p. 485; 23, p. 326.
17. Stereograph; C. Goodrich, Plainfield, Vermont, c. 1872.

II (cont't.)

18. Wells; p. 252.
19. Vermont Business Directory; 1873-74, p. 97; F.W. Beers' County Atlas of Caledonia Vermont with Business Notices (New York: F.W. Beers & Co., 1875) pp. 83-84, 96.
20. Letters Patent No. 160,677; Official Gazette of the U.S. Patent Office, Vol. VIII; 9 March 1875, p. 413. Specifications of Patents, pp. 385-386.
21. Hamilton Child; Gazetteer of Caledonia and Essex Counties, Vermont, 1764-1887 With Business Directory (Syracuse, N.Y.: Syracuse Journal Co., 1887) p. 136; Knight's American Mechanical Dictionary, 1887, p. 1152.
22. Alexander Jack's Probate Records, Vol. 50, pp. 297-298. Caledonia County Court House, St. Johnsbury, Vermont.
23. Child, p. 136; Edward T. Fairbanks, The Town of St. Johnsbury (St. Johnsbury, Vt.: Cowles, 1914) Chapters XI & XXXI.

III.

1. Alexander Jack's Probate Records; Wells, 606.
2. Alexander Jack's Probate Inventory, September 27, 1887.
3. Deed Book 26, p. 255.
4. St. Johnsbury Caledonian, December 8, 1887.
5. Deed Book 26, p. 216.
6. Alexander Jack's Probate Records; St. Johnsbury Caledonian, June 7; November 8, 1888.
7. Deed Book 26, p. 137, 511.
8. Jennie C. Watts and Elsie A. Choate, People of Peacham (Montpelier, Vt.: Vermont Historical Society, 1965), pp. 120-121; Ernest L. Bogart, Peacham: The Story of a Vermont Hill Town (Montpelier, Vt.: Vermont Historical Society, 1948), pp. 370-372.
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10. Interview with John Manning, August 25, 1979.

IV.

1. Wells, p. 511; Bogart, p. 372; Watts and Choate, pp. 172-173.
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3. Deed Book 27, pp. 110, 242, 280; Watts and Choate, pp. 172-173.
4. Interview with John Manning August 25, 1979.
5. Ibid.; Wells, p. 465.
6. Deed Book 30, p. 465.
7. Wells, pp. 511, 269; St. Johnsbury City Directory, 1909-1925; Water Turbines Catalog No. 29, Rodney Hunt Machine Company, Orange, Massachusetts, 1910, Section H "Our Customer's Endorsement."
8. Interview with Burns Goss, August 20, 1979.

IV. (con't)

9. St. Johnsbury Caledonian, June 21, 1911.
10. Barnet Grand Tax List, 1914.
11. Wells, p. 511; St. Johnsbury City Directory, 1917, p. 223.
12. Wells, p. 511.
13. Boomer & Boschert Catalog, 1882; Fairbanks Morse Catalog, 1894, p. 22.
14. Fairbanks Morse Catalog, 1894, p. 200.

V.

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VIII.

1. Wells, p. 465.
2. see also IV. p. 32.
3. Blower 667, No. P 3; Alex W. Bealer, The Art of Blacksmithing (New York: Funk and Wagnalls, 1976), p. 61.
4. Bealer, p. 70; H.R. Bradley Smith Blacksmiths' and Farriers' Tools at Shelburne Museum (Shelburne, Vt.: Shelburne Museum, 1966), pp. 64-67.
5. Smith p. 226.
6. Ibid., p. 225.
7. Ibid., p. 224.
8. Ibid., p. 193.
9. Ibid., p. 225.
10. Smith, pp. 49-55. L.D. Howard was an inventor in St Johnsbury, Vermont.
11. Smith, p. 234, similar to figure 3.
12. Ibid., similar to figure 2.
13. Ibid., pp. 229-232.

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